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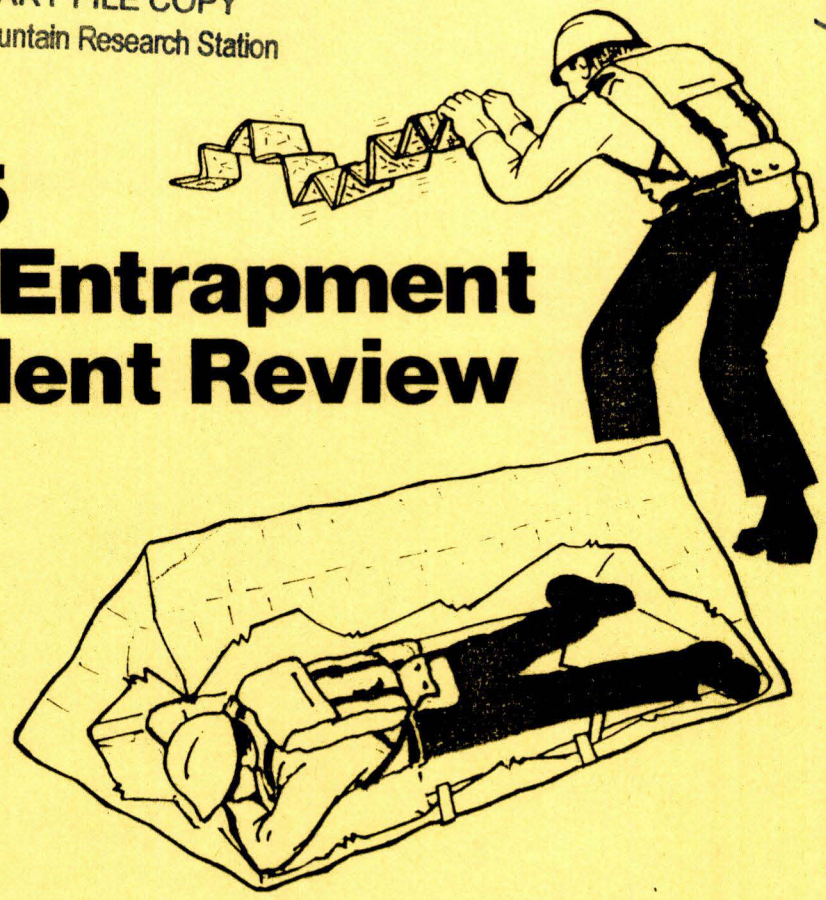

1985 Fire Entrapment Incident Review

Prepared for the
National Wildfire Coordinating Group

By

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Wildfire Community

Dear Colleague:

There were over 200 fire shelter deployments during the 1985 fire season warranting the National Wildfire Coordinating Group (NWCG) to request a review of the fire entrapments. As a result, the enclosed review was presented to the NWCG at their July meeting. National Wildfire Coordinating Group took the following actions regarding the recommendations listed on page 2 of the report:

REC. 1 Forest Service research is continuing their emphasis in gaining an understanding of the fundamental aspects of crown fire development and spread, spotting mechanisms, and other severe or "erratic" fire behavior phenomena.

REC. 2 The Missoula Equipment Development Center is scheduling a fire shelter improvement project for FY 1987.

REC. 3 An Accident/Incident Report for Fire Entrapment or Burns form will be distributed for field use and evaluation prior to September 1, 1986.

REC. 4 Fire shelter training materials are being made available from the BIFC warehouse through the NWCG Publication Management System.

REC. 5 A three member Fireline Safety Committee has been formed to devise a method to collect information on fireline accidents and incidents and to detect national trends in order to minimize or eliminate preventable accidents. The members of the safety committee are:

Jerry Monesmith	USDA-Forest Service, WO
Gene Morse	State of Florida, Tallahassee
Stan Palmer	USDI-Bureau of Land Management, BIFC

John Bethea, Florida State Forester, will serve as the NWCG Liasion.

I want to thank the review team for their fine effort and those who provided the background materials and reports for the review. We believe all of the report findings and recommendations are valid, providing important steps in minimizing the possibilty of future entrapments.

Sincerely,

John W. Chambers

for L. A. AMICARELLA
Chairman, NWCG

SUMMARY OF REVIEW TEAM RECOMMENDATIONS

NWCG:

1. Provide a high priority to fire spread model research to improve responsiveness to crowning, spotting, and large fire spread.

2. Encourage interagency funding of a fire shelter improvement project to accomplish the following:

   - o Analyze hold-down design alternatives.
   - o Determine if nontoxic adhesives are now available that will provide a structurally firm, but yet pliable laminate that will not crack.
   - o Refine Forest Service test standards for materials toxicity.
   - o Study alternatives for a rigid or a more protective carrying case. Correct problem of inner plastic case cracking and problems with pull tabs tearing off.

3. Implement FEWT Accident/Incident Report For Fire Entrapment or Burns for a two year evaluation to determine its suitability.

4. Provide a source of supply for fire shelter training materials through the Publication Management System.

5. Assign an Interagency Team to analyze and recommend guides for committing ground forces to indirect attack and safety precautions necessary when indirect attack is utilized.

STATES AND FEDERAL AGENCIES:

1. Establish a formal process for incident commanders and fire behavior analysts to share key and unusual experiences during periodic workshops.

2. Share discussions and analyses of conditions and situations surrounding unusual experiences through national distribution of video tapes and other media.

3. In training and workshops, emphasize the hazards of overhead becoming overly preoccupied in restrictive or special activities such as new technologies that may distract them from their overall responsibilities.

4. Emphasize the use of both air and ground observation/lookouts on large fires and fires on flat terrain.

5. Ensure all fire personnel receive training on the proper use and deployment of shelters. Where practical, hands-on training should be provided.

6. Emphasize in training and in operational situations, the necessity of critically evaluating alternative suppression stratagies and tactics against values at risk, suppression cost, and most importantly, firefighter and public safety.

7. Formalize the use of on-the-job training and coaching assignments to supplement fire experience.

8. Stress in training and in operational situations that our policy of "fighting fire aggressively, yet safely" means aggressive control is <u>often</u> essential, firefighter safety <u>always</u> essential.

9. Ensure that fully qualified Fire Behavior Analysts are assigned with all overhead team involvements.

INTRODUCTION

Throughout the Nation 1985 was an extremely tough and active fire year. Severe drought conditions covered the Eastern and Western parts of the United States. These drought conditions coupled with local weather conditions allowed for the development of extreme fire behavior causing massive crowning, spotting, and the rapid spread rate of fires.

Over 200 shelters were deployed on incidents managed by State and Federal agencies during the fire season. Conservative estimates indicated over 100 lives were saved as a result of these deployments plus an untold reduction in major injury. While we are thankful for the fortunate outcome of these incidents, the number of situations resulting in entrapments is unprecedented in the last 50 years. The circumstances resulting in these situations are of major concern to the National Wildfire Coordinating Group (NWCG).

As a result NWCG established a three person team to review the fire entrapment incidents.

OBJECTIVES

The teams objective was to identify circumstances leading to and associated with the entrapments to help in minimizing the possibility of future occurrences. Also, in the event future entrapments do occur, to ensure that fire shelter design and training, will maximize the probability of firefighter survival.

PROCEDURE

The Review Team requested shelter deployment report information through the chairman of NWCG. These reports were reviewed along with videc-tape accounts of entrapment situations and other information listed in the appendix. Additionally, selected people were interviewed. Four questions were formulated by NWCG on the premise that answers to these questions would achieve the stated objective. The questions are:

1. Could the entrapment situations been predicted?

2. Would the personnel have been placed in the situations if they had not had shelters.

3. Can or should the shelters be improved?

4. Are shelters being used properly?

FINDINGS - QUESTIONS

Question 1: Could the entrapment situations have been predicted?

Answer: Possibly, but for a number of reasons, they were not predicted in the incidents reviewed.

Background: The question was addressed by determining why the entrapment potentials were not recognized. The reasons found were:

A. Lack of experience
B. Preoccupation with other activities
C. Lack of adequate aerial observation and/or intelligence
D. Inadequate fire spread prediction models

A discussion of each reason follows:

A. Lack of experience. Something was unusual in 1985. Previous to the Butte Fire, a local Fire Specialist had contacted the Intermountain Fire Sciences Laboratory to ask if they were interested in witnessing very unusual and extreme fire behavior. Reports of uncommon fire behavior were coming from the Eastern U.S. as well. It seems this uncommon fire behavior brought on by drought and adverse weather conditions was clearly a factor in the numerous entrapments.

   Even though many of the field and overhead personnel were highly experienced in fire suppression and large fire involvement, they were inexperienced in the uncommon fire behavior that occured.

   Fire spread computer models, when used, did not compensate for this lack of experience since spread rates at the time of the entrapments exceeded computer model predictions.

   Some adjustments were made, however, the full magnitude of the fire behavior potentials, under these conditions, was not adequately determined or recognized. Although a number of factors contributed to the entrapments, a part of the problem can be attributed to the lack of experience or ability to adequately assess the magnitude of the fire behavior potential under the 1985 conditions.

   A common denominator in the entrapments was an indirect attack strategy at the head of the fire. Adequate guides/criteria were not available to aid command teams in determining when ground forces should or should not be employed for indirect attack. Many of the tried and true "rules" such as "keep one foot in the burn" and "bring fire with you" that have kept firefighters out of trouble for years have fallen by the wayside.

B. Preoccupation with other activities. In some cases key overhead and aerial observation personnel were occupied with other activities (i.e., flagging line; observing helitorch operations; preparing initial action plans). If they had been observing overall fire behavor and suppression activity, adequate warnings probably could have been provided.

C. Lack of aerial observation and/or intelligence. Ground stationed "lookouts" on very large fires and fires on flat terrain were not always supplemented with aerial observations. Appropriate warnings were not given because fire behavior and spread was not observed.

D. Inadequate fire spread prediction models. Current fire spread models are limited in their ability to accurately predict fire behavior in crowning and spotting conditions.

RECOMMENDATIONS

A. A formal process should be established for incident commanders and fire behavior specialists to share key and unusual experiences during periodic workshops.

B. Discussions and analyses of conditions and situations surrounding unusual experiences should be documented, preferably by video tape and distributed nationally to share these uncommon experiences with others.

C. In training and workshops, emphasize the hazard of overhead becoming overly preoccupied in restrictive or special activities such as new technologies that may distract them from their overall responsibilities.

D. Emphasize the use of both air and ground observation/lookouts on large fires and fires on flat terrain.

E. Provide a high priority to fire spread model research to improve responsiveness to crowning, spotting, and large fire spread.

F. Assign an Interagency Team to analyze and recommend guides for committing ground forces to indirect attack and safety precautions necessary when indirect attack is utilized.

G. Emphasize in training and in operational situations, the necessity of critically evaluating alternative suppression strategies and tactics against values at risk, suppression cost, and most importantly, firefighter and public safety.

Question 2: Would the personnel have been placed in the situations if they had not had shelters?

Answer: Yes. This review provided no indication that plans, tactics, or strategies related to any of the entrapment incidents were based upon the availability or use of fire shelters as a safety contingency.

Background: This concern was addressed by asking "are shelters creating a false sense of security?" We found no evidence of this. Personnel and overhead interviewed indicated that shelters were not a factor in the placement of crews. Entrapped firefighters believed other mistakes had been made. No one seemed proud of the fact they had gone through the experience, in fact quite the contrary.

Some overhead relied upon dozer lines and safety zones to a certain extent. For instance, they stated they would not have placed crews on handline in the same location. Again, the availability of fire shelters was not a consideration or factor in crew placement.

Nearly everyone stated that the use of shelters is a "last resort action" and that everything possible should be done to prevent entrapment.

There is some debate, however, about our "macho energetic" approach to fire suppression. Some people believe personnel are placed in hazardous situations because of the pressure to contain and control the fire. These are common statements: "Just a little longer and we'll get it;" "If we can tie the line together it will be over;" "All we have to do is control the spots;" "Hold on till the sun goes down and we'll have it;" Hold it till the retardant gets here;" "We must keep it on this side of the ridge."

Recommendation

- Fire suppression personnel must clearly understand our policy of fighting fire aggressively, yet safely. Aggressive control is often essential, firefighter safety is always essential. This basic policy and its application must be stressed in training courses and in operational situations.

Question 3: Can or should the shelter be improved?

Answer: Yes.

Background: Entrapment experiences, particularly those on the Butte Fire on the Salmon National Forest, show the basic shelter design to be adequate. Shelters protected well against heat and smoke even though some had large tears and holes. Although the value of the shelter was clearly demonstrated some deficiencies were identified which included:

- o 4 to 18 inch long tears in some shelters.
- o Some hold-down straps ripped off.
- o Difficulty in opening some shelter packages.
- o Difficulty in holding the shelters down during high winds and in a few instances keeping the shelters from collapsing against the occupant.

Recommendations:

Initiate a shelter improvement project to accomplish the following:

A. Analyze hold-down design alternatives.

B. Determine if nontoxic adhesives are now available that will provide a structurally firm, but yet pliable laminate that will not crack.

C. Refine Forest Service test standards for materials toxicity.

D. Study alternatives for a rigid or a more protective carrying case. Correct problem of inner plastic case cracking and problems with pull tabs tearing off.

Question 4: Are shelters being used properly?

Answer: Generally yes, however, some people like contract sawyers, dozer operators, and National Guard truck drivers are receiving no training.

Background: Reports from previous years indicate that shelters have been deployed unnecessarily. However, entrapments investigated for this report indicated that last resort situations existed in each case. All deployments were justified and absolutely necessary.

There is some question as to whether all deployments were reported. Currently there is no requirement for reporting. Some very serious occurrences would not have been known except for casual verbal reports. Without a uniform and required reporting system or review process, questions on the proper use and suitability of shelters are difficult to accurately answer.

Under direction of NWCG, the National Fire Equipment Working Team has developed a Fire Entrapment or Burn Accident Incident reporting system. The reporting form is expected to be available by September 1986.

Interviews with firefighters on the Butte Fire soon after their entrapment experience, revealed that employees of State and Federal agencies all had some level of fire shelter training. Shelter training for crew members tended to be better than for overhead. Most crews reported having hands on training with fire shelters whereas most overhead only had seen the film "Your Way Out." In contrast, contract sawyers and dozer operators had no training. It was also learned that National Guard truck drivers transporting crews to and from the line, had received no training in shelter deployment.

Although many people successfully deployed their shelters without having previous hands-on training, they all stressed such training would be beneficial and should be required.

Several new training programs are being prepared and revised. The pamphlet Your Fire Shelter has been recently revised. The film Your Way Out is being replaced by a video tape and film entitled Your Fire Shelter. In addition, a NWCG Butte Fire Shelter Deployment video was produced to share the experiences on that incident.

Recommendations:

A. Establish a uniform and timely reporting system for shelter deployments.

B. Ensure all fire personnel receive training on the proper use and deployment of shelters. Where practicle, hands-on training should be provided.

C. Provide a source of supply for fire shelter training materials.

FINDINGS - STRENGTHS

In the process of analyzing the previous questions a number of positive aspects related to the incidents were found. Once the last resort situation occurred, these aspects and strengths were key in saving lives and reducing serious injury.

1. Outstanding decision-making and independent actions were taken by Crew Bosses and Strike Team Leaders. This included decisions to evacuate, backfire, and deploy shelters. Their experience, training and actions saved lives and reduced injury.

2. Control was maintained in potential panic situations. Personnel maintained verbal communication and accountability, and assisted each other in herioc manners.

3. Shelters protected well against both radiant heat and smoke even though some had large holes or tears.

4. Most trapped firefighters had previous hands-on shelter training and knew how to deploy and use fire shelters.

APPENDIX

INFORMATION REVIEWED

1. Butte Fire Shelter Deployment Report.

2. Comments from individuals involved in fire shelter deployment situations, video and written narratives.

3. Fire Review of the 1985 Long Tom Fire Complex.

4. Report on Fire Shelter Deployment, Lake Mountain Fire 7/4/85, Salmon National Forest.

5. Fire Tent Incident, St. Marks Pond Fire.

6. Boyd Fire, Taylor County, Florida, May 17, 1985.

7. Incident Investigation Report, Hopewell/Nursey Fire.

8. Butte Fire Behavior Assessment by R. C. Rothermel.

9. Fire Shelter Incident, Lake Mountain Fire by James E. Stumpf.

10. Psychological reports of the Safety of Firefighters by Dr. Tenence M. Allen.

11. Fire Suppression Task Force Report, February 1974, Region 1, USDA-FS.

12. Fatal/Near Fatal Wildland Fire Accidents, Report of US/Canadian Task Force, April 1980.

13. USDA-FS Region 1, 1985, Fire Season Analysis Report.